

From: [McKenna, Jim](#)
To: [Eric Blischke/R10/USEPA/US@EPA](#)
Cc: [johnt@windwardenv.com](#); [jworonets@anchorenv.com](#); [Lewis, Mark](#); [rjw@nwnatural.com](#); [Chip Humphrey/R10/USEPA/US@EPA](#); [Burt Shephard/R10/USEPA/US@EPA](#); [rgensemer@parametrix.com](#)
Subject: Re: Benthic Interpretation
Date: 08/01/2009 11:48 PM

Thank you Eric. Jim.

----- Original Message -----

From: Blischke.Eric@epamail.epa.gov <Blischke.Eric@epamail.epa.gov>
To: McKenna, Jim
Cc: johnt@windwardenv.com <johnt@windwardenv.com>; jworonets@anchorenv.com <jworonets@anchorenv.com>; Lewis, Mark; rjw@nwnatural.com <rjw@nwnatural.com>; Humphrey.Chip@epamail.epa.gov <Humphrey.Chip@epamail.epa.gov>; Shephard.Burt@epamail.epa.gov <Shephard.Burt@epamail.epa.gov>; rgensemer@parametrix.com <rgensemer@parametrix.com>
Sent: Fri Jul 31 14:31:08 2009
Subject: RE: Benthic Interpretation

Jim, just to follow-up on your email below and subsequent voice message.

Due to schedule constraints, EPA does not expect the benthic approach described below to be incorporated into the draft baseline risk assessment expected to be delivered to EPA on August 31, 2009. However, EPA would like to stress that the approach outlined below is fully consistent with the MacDonald benthic risk approach originally provided to the LWG in September 2008 and clarified through a series of email messages in October 2008, November, 2008, February 2009 and finally March 31, 2009. Further, EPA will be using the approach described below in our interpretation of sediment bioassay results for the purpose of 1) evaluating the nature and extent of contamination; 2) estimating the risks to the benthic community; 3) developing sediment cleanup levels; 4) refining AOPCs into SMAs; 5) developing and screening remedial action alternatives; and 6) any other evaluations and analyses as we see fit.

Regarding the approach outlined below, EPA failed to note in our July 17, 2009 email that the development of the reference envelope approach should be based on log-transformed data consistent with the MacDonald benthic risk evaluation approach. Revised language (in red bold text) is provided below:

- The raw toxicity data are to be expressed in terms of the proportion of survivorship or biomass, depending on the toxicity test, relative to the laboratory control survivorship or biomass. Reference envelope responses for each of the 17 stations are to be calculated using the following formulas: $\text{Survival} = T / C$, where T and C are the test sample (T) survival and laboratory control sample (C) survival, respectively. $\text{Biomass} = \text{REB} / \text{LCB}$, where REB and LCB are the reference envelope sample (REB) and laboratory control sample (LCB) biomass, respectively.
2. The survival and biomass results for all 17 reference envelope station for each of the four toxicity tests are placed into rank order, and log-transformed if the software does not automatically perform the log transformation.
 3. Using a statistical software package to be approved by EPA, the best fitting statistical distribution for each of the four sets of reference envelope data will be calculated using the log-transformed data. The specific software package to be

employed is not as important as being sure it is one of the more statistically robust packages with a number of distributions available for fitting. Examples of acceptable software packages include, but are not limited to SAS, Systat, SPSS, Statistica, Best Fit, @Risk or Crystal Ball.

4. Several statistical procedures for quantifying the best fit from amongst several given distributions (e.g. normal, lognormal, logistic, Weibull, gamma, etc.) are available. Among the more commonly employed procedures are the Anderson-Darling procedure, the Kolmogorov-Smirnov D statistic and the chi-squared test. Of these, the Anderson-Darling procedure is preferred by EPA, because it gives more weight to the fit in the tails of the distribution than either the Kolmogorov-Smirnov statistic or the chi-squared test.
5. It is likely that more than one statistical distribution will give high quality fits to each of the four reference envelope data sets. As a check on the statistical distribution fitting output, probability plots for the three best fitting distributions for each of the four reference envelope data sets will be plotted. With EPA agreement, a distribution may be selected for a reference envelope data set that does not have the best fit based on the results of the Anderson-Darling procedure, but which, upon visual inspection of the probability plots, fits the lower (i.e., 5th percentile) tail of the reference envelope distribution better than the distribution with the best Anderson-Darling fit. It is reiterated that EPA must agree to the selected distribution for each of the four reference envelope data sets.
6. Once the statistical distributions for the four reference envelope data sets are selected, the lower 5th percentile of each data set is calculated, using output from the same statistical package used to fit the distribution, and the 5th percentiles, which are still log-transformed, are back transformed to survival and biomass values.
7. Calculations should be made with more significant digits than will be needed for the final values of the reference envelope. Reference envelope values will not be rounded until after all calculations are complete.

Please let me know if you have any questions about this.

Thanks, Eric

"McKenna, Jim"
<Jim.McKenna@portland.com>
07/21/2009 11:24 AM
To
Eric Blischke/R10/USEPA/US@EPA
cc
<rjw@nwnatural.com>,
<jworonets@anchorenv.com>,
<johnt@windwardenv.com>, "Lewis, Mark"
<mlewis@newfields.com>
Subject
RE: Benthic Interpretation

Eric,

As a follow-up on our phone call this morning I want to confirm that the benthic approach presented below in your email is not expected to be in the draft BERA. For the draft BERA the LWG will proceed per your instruction at the last Portland Harbor Managers Meeting. Thanks, Jim.

From: Blischke.Eric@epamail.epa.gov [<mailto:Blischke.Eric@epamail.epa.gov>]
Sent: Friday, July 17, 2009 5:40 PM
To: Wyatt, Robert; johnt@windwardenv.com
Cc: Humphrey.Chip@epamail.epa.gov; Shephard.Burt@epamail.epa.gov; rgensemer@parametrix.com; jay.field@noaa.gov; Goulet.Joe@epamail.epa.gov
Subject:

Bob, As you are aware, we have been discussing some of the details of the LWG's interpretation of the Portland Harbor sediment bioassay results. Some elements of the interpretation were discussed during a conference call on Thursday, June 18, 2009. EPA has further reviewed the bioassay results and information regarding the bioassay interpretation provided by the John Toll on behalf of the LWG.

Here is where I believe we are:

- 1) No transcription errors were identified during a review of the reference envelope bioassay results. However, minor discrepancies between effect levels observed between EPA and LWG have been noted in the raw data. EPA believes these are due to rounding errors and use of different numbers of significant digits during calculations. To eliminate these discrepancies, calculations based on the raw toxicity data, such as the proportion of sample survival and biomass relative to laboratory control and the reference envelope calculations, should be carried through to as many significant digits as the data permits. Rounding of results should take place only after calculations are complete
- 2) The total biomass calculations were done correctly. Although small discrepancies were identified, they appear to be due to either minor differences in rounding or significant digits or, in the case of the two stations with duplicate results, the treatment of these samples as individual samples rather than the arithmetic mean of two data points.
- 3) Mortality should be calculated as percent survivorship relative to control and control normalized values should be computed as test/control. This is consistent with Table 2-1 in the March 17, 2006 Bioassay Interpretation Report, ASTM Method E-1706, and EPA Guidance.
- 4) Duplicate reference envelope samples should be pooled (arithmetic mean) rather than treated as individual samples. This is consistent with EPA's March 31, 2009 direction on the development of the reference envelope (see last paragraph, first page).
- 5) Identification of Level 1, Level 2 and Level 3 thresholds: The toxicity thresholds should be calculated based on 10% of the reference envelope not an absolute 10%. This is consistent with Tables RE 1, RE-2 and the text of EPA's March 31, 2009 direction on the Calculation and Use of Reference Envelope for Portland Harbor Sediment Toxicity Test

Interpretation.

6) The reference envelope for the four types of sediment toxicity tests performed at Portland Harbor is the lower 5th percentile of the best fitting statistical distribution of the survivorship and biomass responses of the test organisms at the 17 reference envelope sample locations. The 5th percentile will be calculated as follows:

The raw toxicity data are to be expressed in terms of the proportion of survivorship or biomass, depending on the toxicity test, relative to the laboratory control survivorship or biomass. Reference envelope responses for each of the 17 stations are to be calculated using the following formulas: $\text{Survival} = T / C$, where T and C are the test sample (T) survival and laboratory control sample (C) survival, respectively. $\text{Biomass} = \text{REB} / \text{LCB}$, where REB and LCB are the reference envelope sample (REB) and laboratory control sample (LCB) biomass, respectively.

The survival and biomass results for all 17 reference envelope station for each of the four toxicity tests are placed into rank order.

Using a statistical software package to be approved by EPA, the best fitting statistical distribution for each of the four sets of reference envelope data will be calculated. The specific software package to be employed is not as important as it being one of the more statistically robust packages with a number of distributions available for fitting. Examples of acceptable software packages include, but are not limited to SAS, Systat, SPSS, Statistica, Best Fit, @Risk or Crystal Ball.

Several statistical procedures for quantifying the fit of a given distribution (e.g. normal, lognormal, logistic, Weibull, gamma, etc.) are available. Among the more commonly employed procedures are the Anderson-Darling procedure, the Kolmogorov-Smirnov D statistic and the chi-squared test. Of these, the

Anderson-Darling procedure is preferred by EPA, because it gives more weight to the fit in the tails of the distribution than either the Kolmogorov-Smirnov statistic or the chi-squared test.

It is likely that more than one statistical distribution will give high quality fits to each of the four reference envelope data sets. As a check on the statistical distribution fitting output, probability plots for the three best fitting distributions for each of the four reference envelope data sets will be plotted.

With EPA agreement, a distribution may be selected for a reference envelope data set that does not have the best fit based on the results of the Anderson-Darling procedure, but which, upon visual inspection of the probability plots, fits the lower tail of the reference envelope distribution better than the distribution with the best Anderson-Darling fit. It is reiterated that EPA must agree to the selected distribution for each of the four reference envelope data sets.

Once the statistical distributions for the four reference envelope data sets are selected, the lower 5th percentile of each data set is calculated, using output from the same statistical package used to fit the distribution.

The above procedures for computing the results of the bioassay tests, calculating hit/no-hit designations, developing the reference envelope and identifying Level 1, Level 2 and Level 3 toxicity hits should be followed.

As we have discussed, it would be helpful if we can schedule a conference call with you and John to discuss this further.

Thanks, Eric